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Ours et al.

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(54) **SYSTEM FOR PRODUCING A TRANSPORTABLE CONTAINER FOR FLOWABLE BULK GOODS**

(71) Applicant: **Kellogg Company**, Battle Creek, MI (US)

(72) Inventors: **Dave Ours**, Marshall, MI (US); **Sharon Juntunen**, Portage, MI (US)

(73) Assignee: **KELLOGG COMPANY**, Battle Creek, MI (US)

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CPC ***B65D 71/0096*** (2013.01); ***B65B 1/02*** (2013.01); ***B65B 1/36*** (2013.01); ***B65B 11/025*** (2013.01); ***B65B 11/045*** (2013.01); ***B65B 53/02*** (2013.01); ***B65B 19/44*** (2013.01); ***B65D 71/08*** (2013.01); *B65D 2571/0003* (2013.01);
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(58) **Field of Classification Search**
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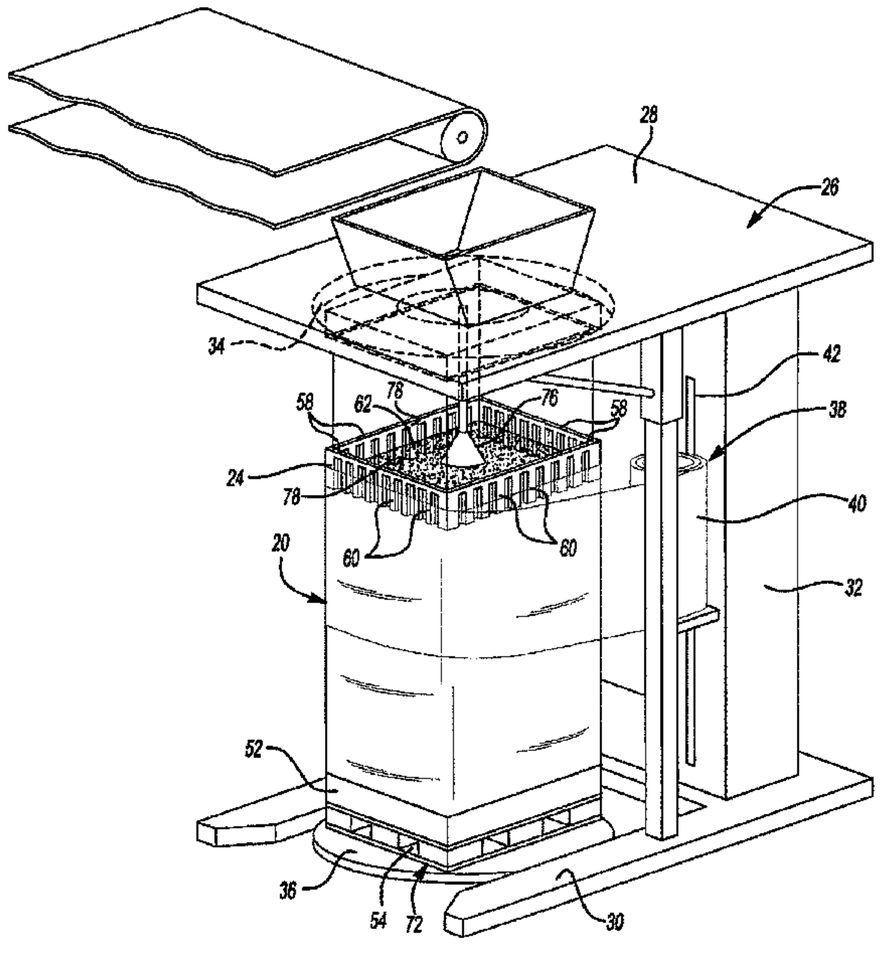
Primary Examiner — Stephen F. Gerrity
(74) *Attorney, Agent, or Firm* — Honigman LLP; Kathryn D. Doyle, Esq.; Jonathan P. O'Brien

(57) **ABSTRACT**

A transportable container for flowable bulk goods includes a bottom support and a stretch wrap spirally wrapped around the bottom support and extending vertically in relationship to the bottom support. Bulk goods are disposed within the stretch wrap and at least of portion of the bulk goods are disposed in direct contact with the stretch wrap to squeeze the bulk goods together and generate hoop forces for stabilizing the bulk goods in the transportable container. The transportable container has a shape that varies radially in vertical relationship to the bottom support for adjusting the hoop forces vertically along the transportable container. The varied shape of the transportable container can be, for example, tapered, hour-glass shaped, or pumpkin shaped.

16 Claims, 6 Drawing Sheets



Related U.S. Application Data

application No. 13/466,166, filed on May 8, 2012, now Pat. No. 8,276,347, which is a division of application No. 12/553,406, filed on Sep. 3, 2009, now Pat. No. 8,191,341.

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USPC 53/399, 436, 441, 442, 449, 459, 469, 53/526, 528, 139.1, 173, 176, 556, 557, 53/570, 574, 575, 576, 577, 587, 284.7

See application file for complete search history.

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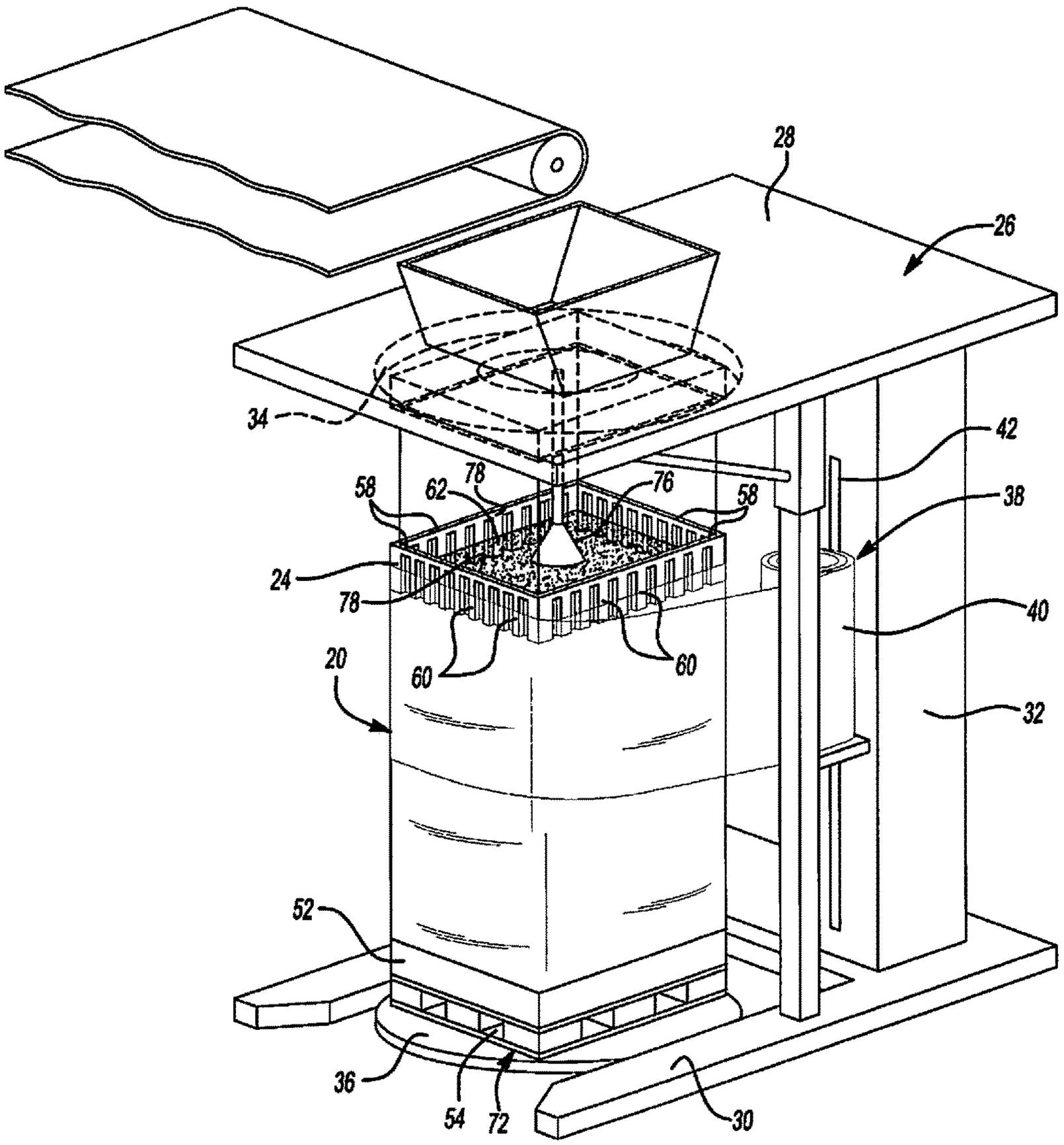

Fig-1

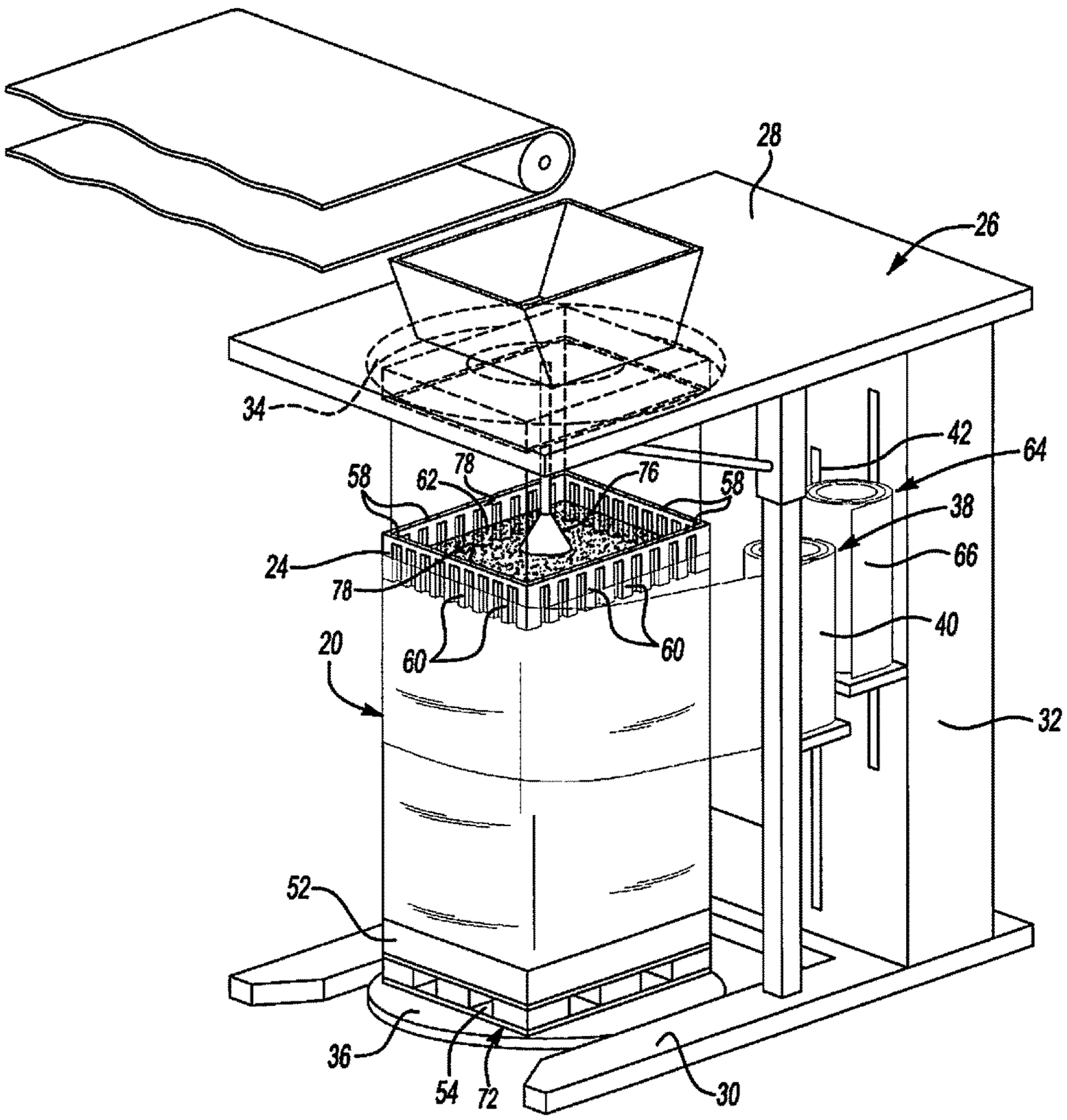

Fig-2

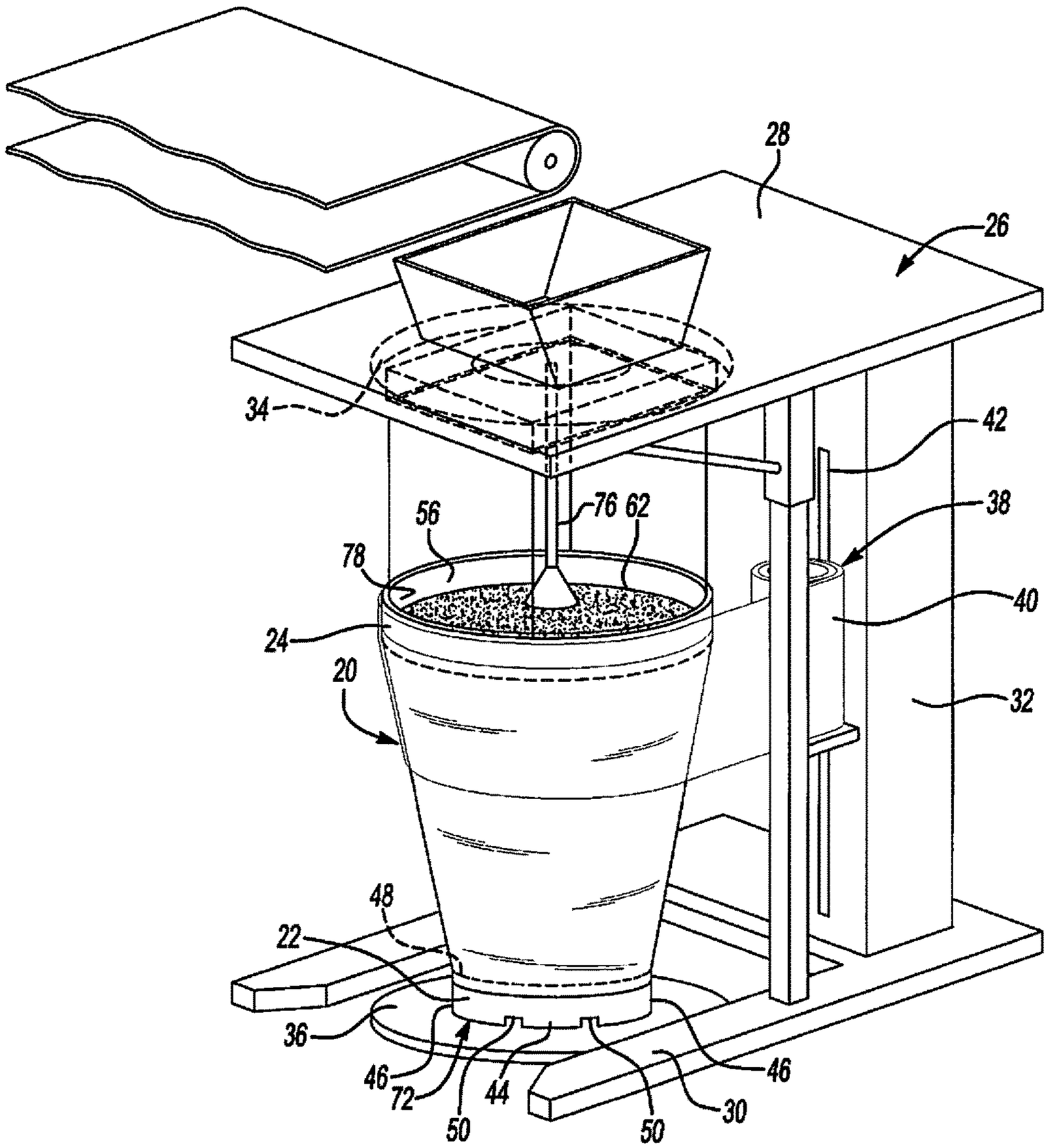

Fig-3

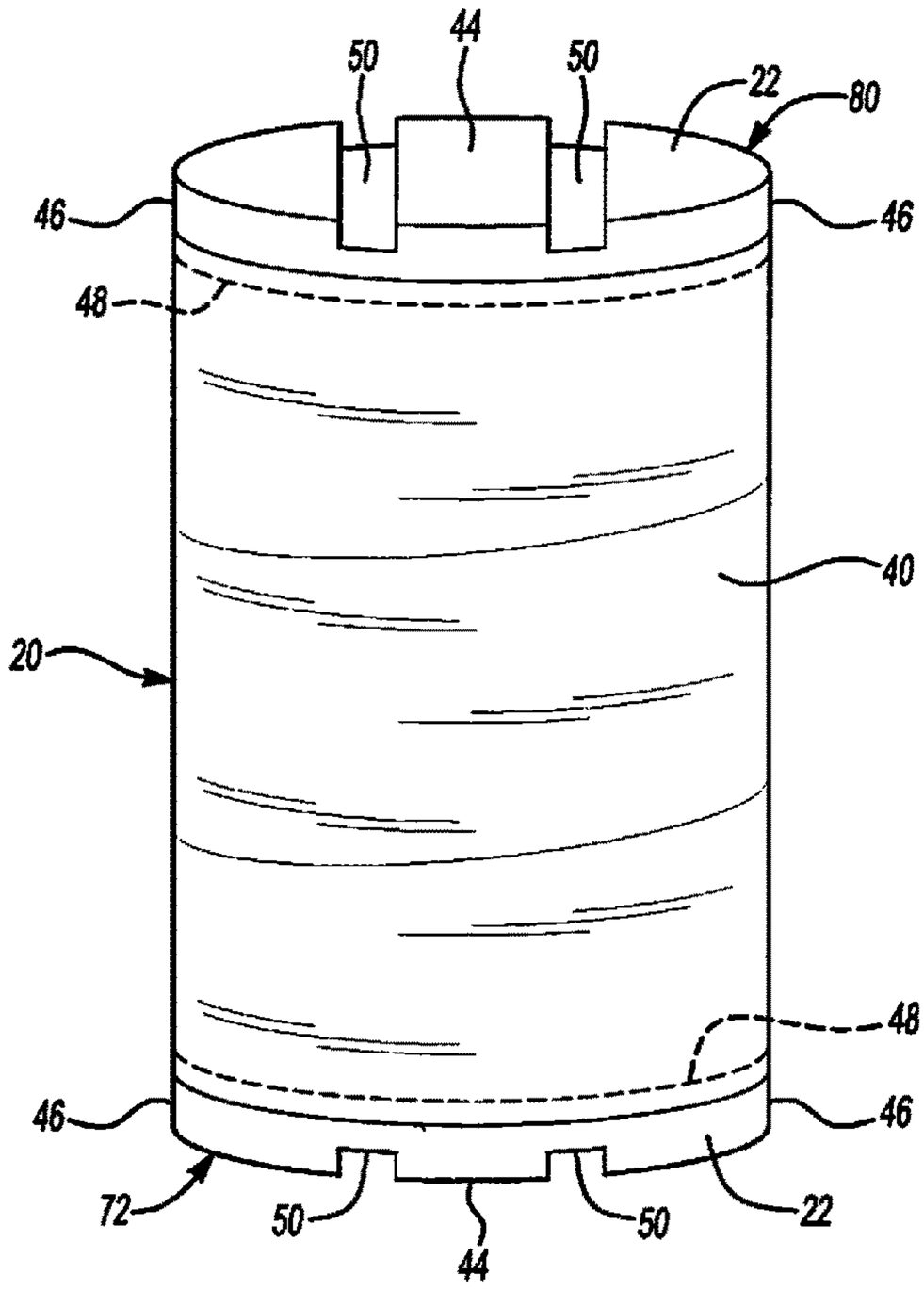
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Fig-4

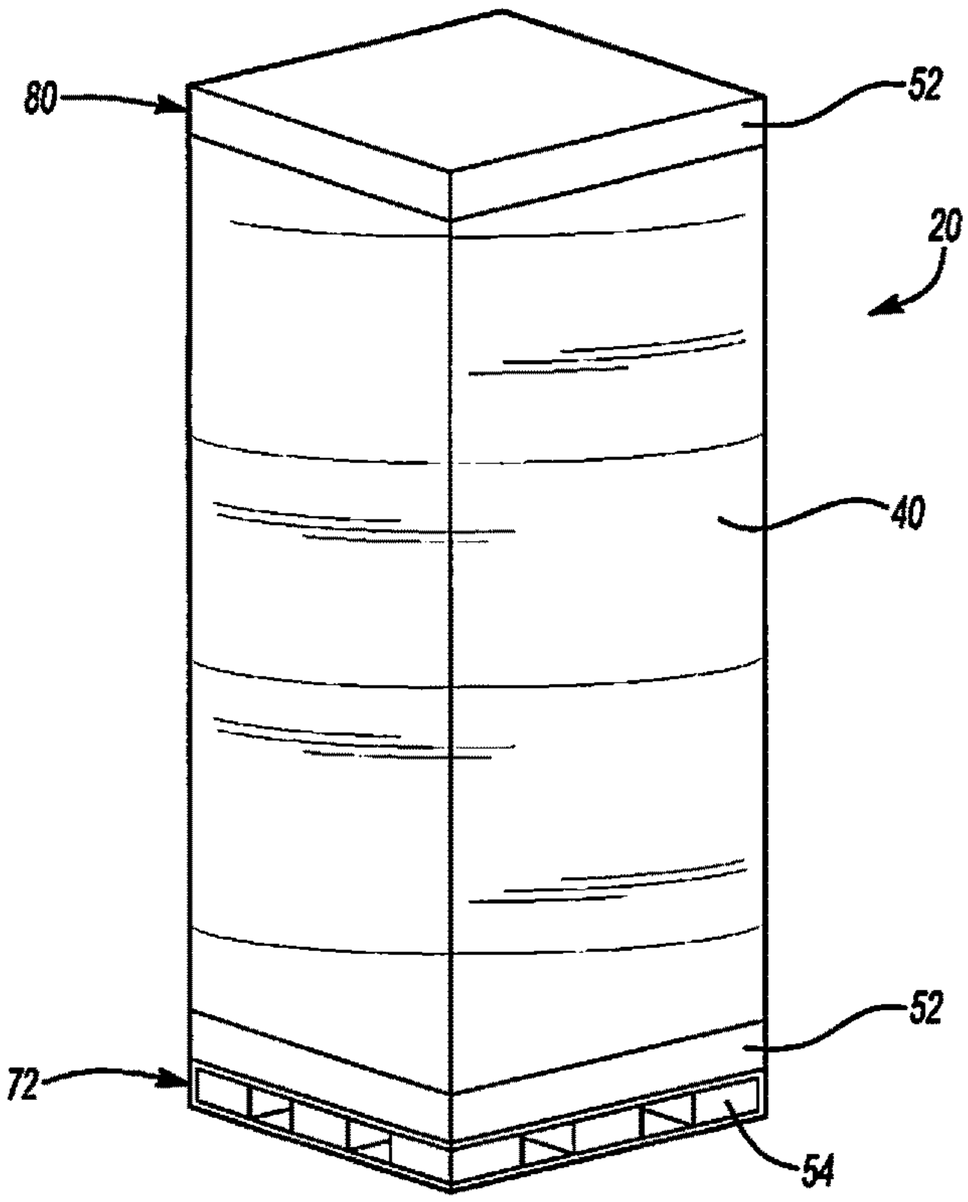
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Fig-5

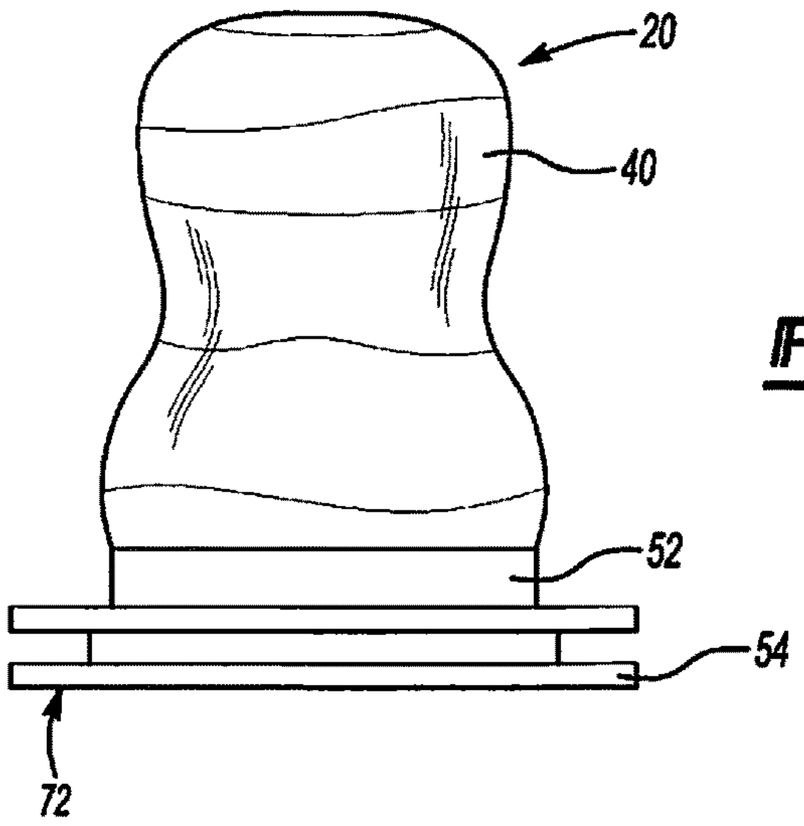

Fig-6

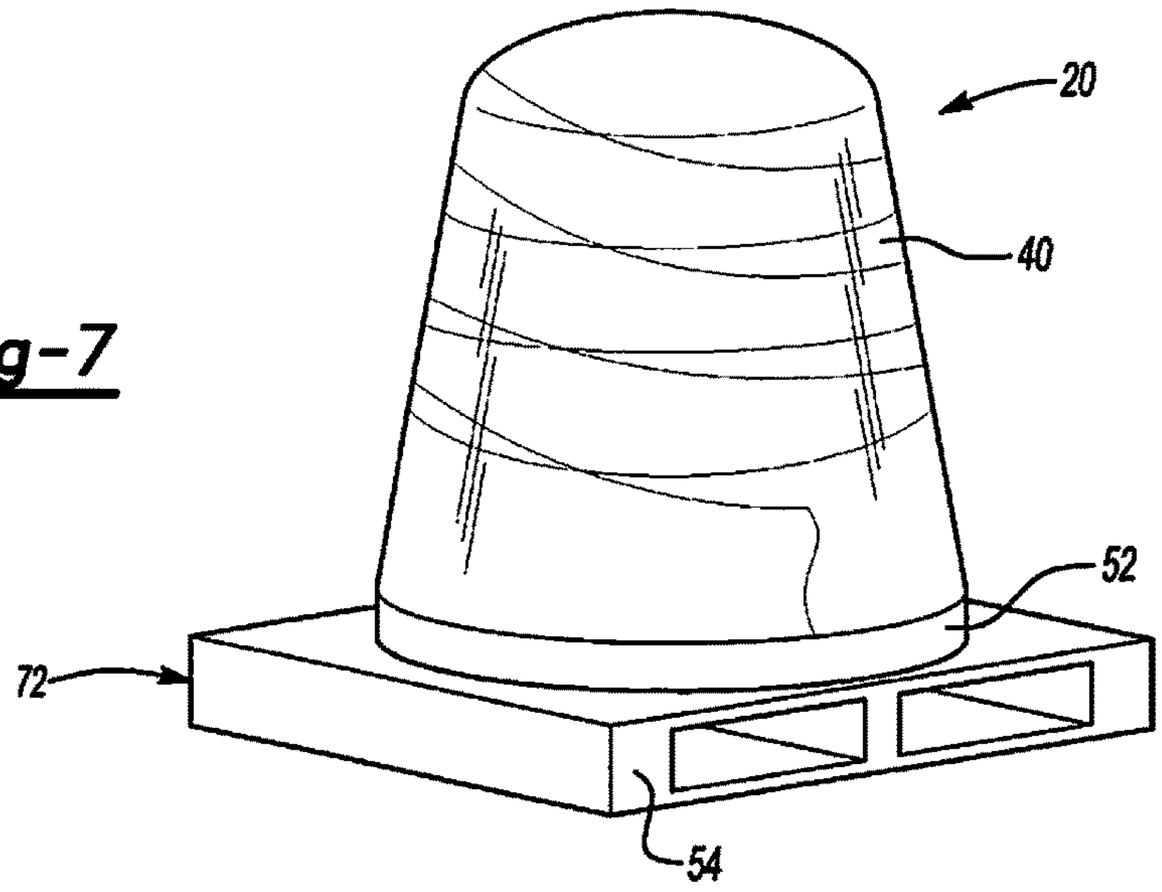

Fig-7

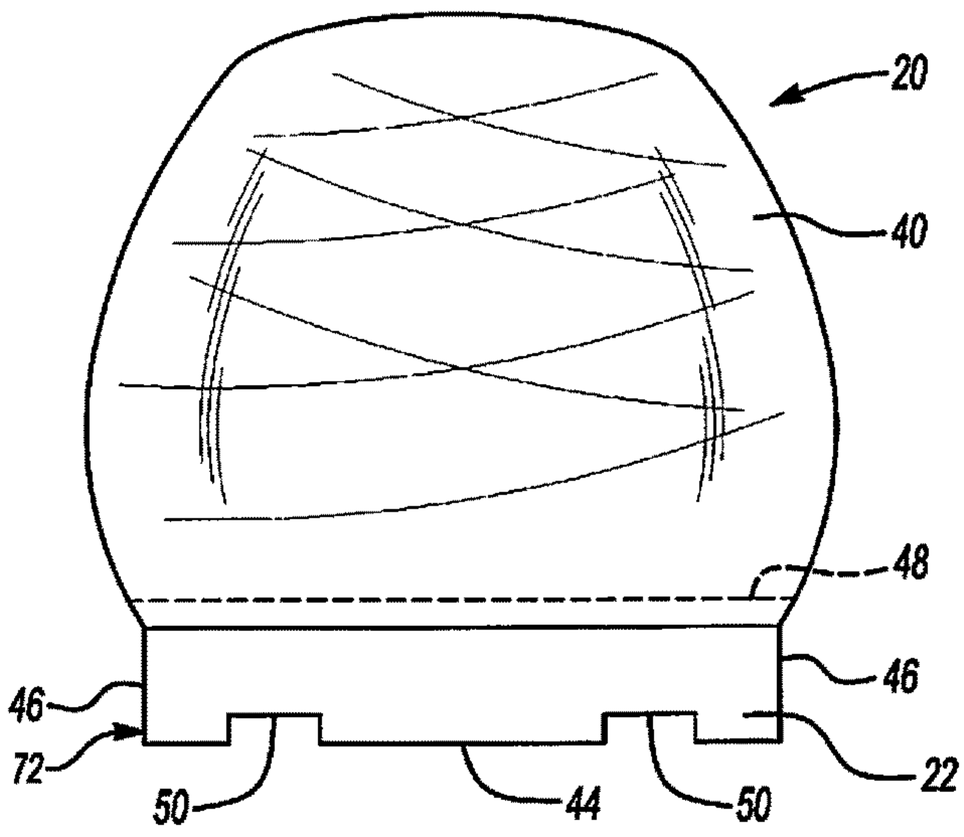

Fig-8

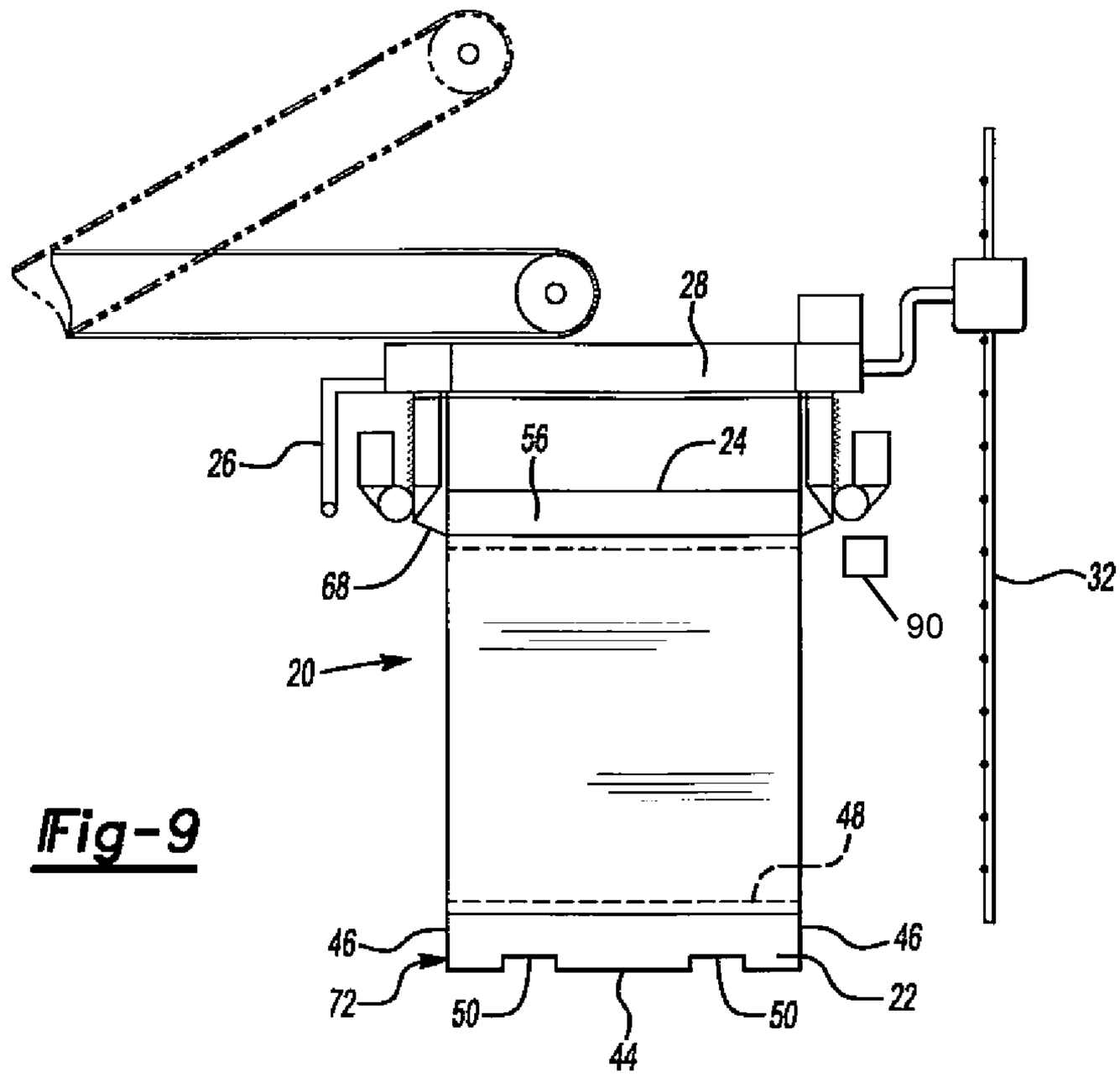
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Fig-9

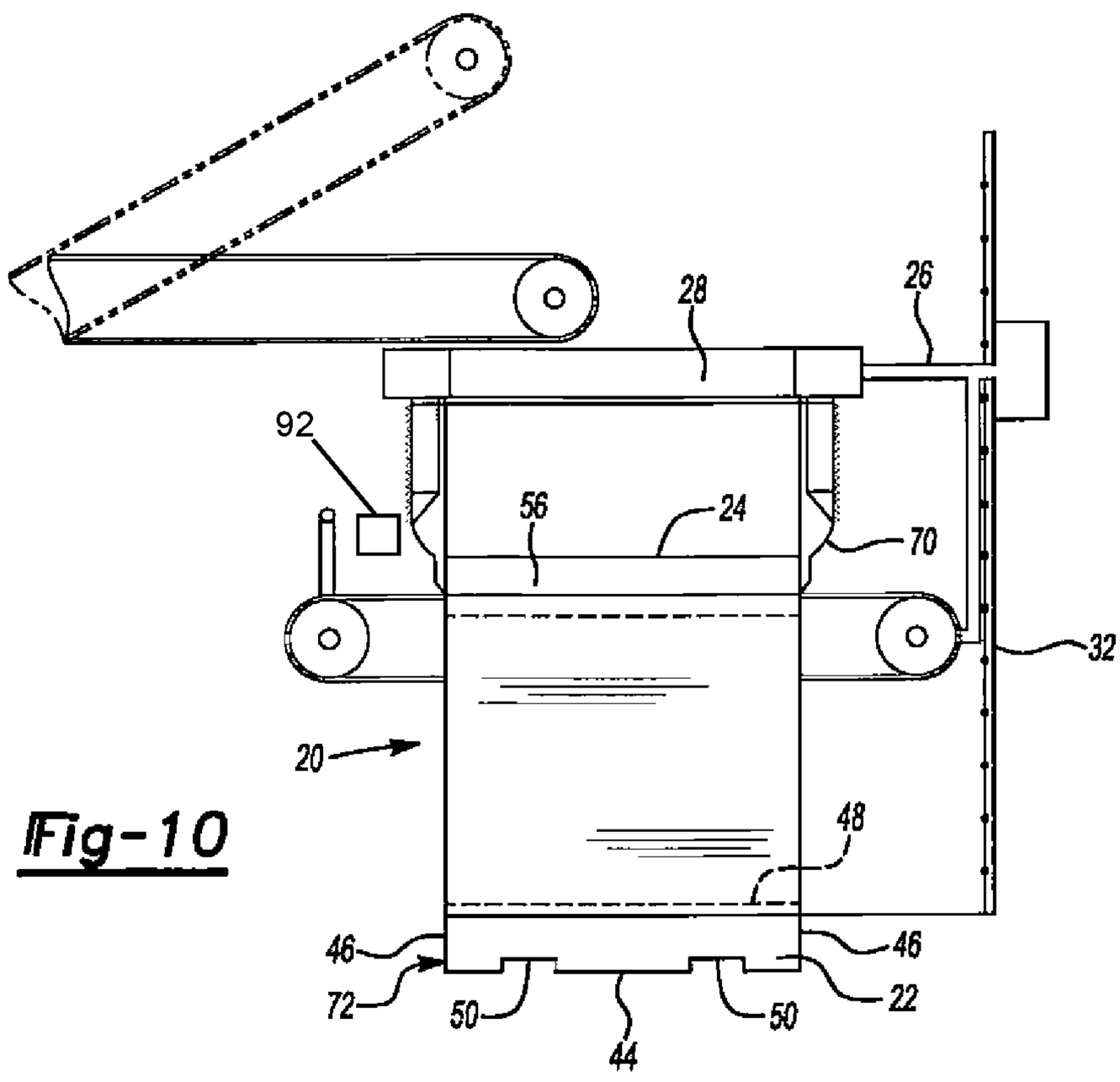
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Fig-10

SYSTEM FOR PRODUCING A TRANSPORTABLE CONTAINER FOR FLOWABLE BULK GOODS

CROSS REFERENCE TO RELATED APPLICATION

This application is a Continuation of U.S. patent application Ser. No. 13/593,762, filed Aug. 24, 2012, which is a division of U.S. patent application Ser. No. 13/466,166, now U.S. Pat. No. 8,276,347, for a METHOD FOR FORMING A TRANSPORTABLE CONTAINER FOR BULK GOODS, filed May 8, 2012, which is a division of U.S. patent application Ser. No. 12/553,406, now U.S. Pat. No. 8,191,341 for a METHOD FOR FORMING A TRANSPORTABLE CONTAINER FOR BULK GOODS, filed Sep. 3, 2009, which claims the benefit of U.S. Provisional Patent Application Ser. No. 61/093,798 for a TRANSPORTABLE CONTAINER FOR BULK GOODS AND METHOD FOR FORMING THE SAME, filed on Sep. 3, 2008, which are hereby incorporated by reference in their entirety.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The subject invention relates to a transportable container for flowable bulk goods.

2. Description of the Prior Art

Typical containers utilized for transport of bulk goods are inefficient, do not have a very large volume, and often require a large amount of manual labor to be used in filling and handling of the container. Also these containers are typically stacked on top of each other during handling and transport, because the containers are not stabilized, this results in damage to the material. It is known in the art of stretch wrapping to stack loads onto a pallet and then shrink wrap the load placed upon the pallet to secure it.

An example of one such system is shown in U.S. Pat. No. 6,594,970 to Hyne et al. The Hyne patent discloses a method and apparatus for wrapping an outer wrap around a stack of products on a bottom support. The system uses a guide which acts as a bather between the stack of product and the outer wrap. To begin the bottom support is placed at a location adjacent the guide and layers of product are added to the pallet to form the stack. As the layers of products are added to the pallet, the pallet begins to move downwardly from the guide to allow for the outer wrap to be applied to the product to secure and stabilize it. The outer wrap is applied to the guide prior to being received by the layers of products so that the layers of products are not crushed or displaced by the outer wrap.

Another example of one such system is shown in U.S. Pat. No. 4,607,476 to Fulton Jr. The Fulton patent discloses a system for applying an outer wrap to unstable stacks of product on a pallet. The system includes a confinement container having a bottom support or pallet placed on a lift. Layers of unstable product are placed on the pallet to form a stack within the confinement container. A top cap is placed on the top of the unstable layers and the outer wrap is initially applied around the top cap and the upper edge of the confinement container. The lift moves the pallet of unstable products upward and the outer wrap slides off the edge of the

confinement container to contact the layers of product for stabilizing the stacks of product.

SUMMARY OF THE INVENTION AND ADVANTAGES

A transportable container for flowable bulk goods includes a bottom support and a stretch wrap spirally wrapped around the bottom support and extending vertically in relationship to the bottom support. Bulk goods are disposed within the stretch wrap, and at least a portion of the bulk goods are in direct contact with the stretch wrap to squeeze the bulk goods together and create hoop forces for stabilizing the bulk goods in the transportable container. The direct contact between the stretch wrap and a portion of bulk goods is advantageous because the hoop forces created allow for a very compact and rigid transportable container which does not allow the bulk goods to shift or get crushed within the transportable container. The hoop forces promote bridging between the bulk foods thereby reducing the relative motion between the pieces and immobilize the bulk goods within the transportable container.

BRIEF DESCRIPTION OF THE DRAWINGS

Other advantages of the present invention will be readily appreciated, as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

FIG. **1** is perspective view of a first exemplary embodiment of a transportable container formed from a packaging system according to the subject invention;

FIG. **2** is perspective view of a second exemplary embodiment of a transportable container formed from a packaging system according to the subject invention;

FIG. **3** is perspective view of a third exemplary embodiment of a transportable container formed from a packaging system according to the subject invention;

FIG. **4** is perspective view of a first exemplary transportable container being circular in cross section and formed according to the subject invention;

FIG. **5** is perspective view of a second exemplary transportable container being square in cross section and formed according to the subject invention;

FIG. **6** is front view of a third exemplary transportable container being hour glass shaped and formed according to the subject invention;

FIG. **7** is perspective view of a fourth exemplary transportable container being tapered and formed according to the subject invention;

FIG. **8** is perspective view of a fifth exemplary transportable container being pumpkin shaped and formed according to the subject invention;

FIG. **9** is side view of a fourth exemplary embodiment of a transportable container formed from a packaging system according to the subject invention; and

FIG. **10** is side view of a fifth exemplary embodiment of a transportable container formed from a packaging system according to the subject invention.

DETAILED DESCRIPTION OF THE EXEMPLARY EMBODIMENTS

Referring to the Figures, wherein like numerals indicate corresponding parts throughout the several views, a trans-

portable container **20** of bulk goods and a method of making the same are generally shown.

Throughout the present specification and claims the phrase "bulk goods" is used as a shorthand version of the wide range of products that can be packaged utilizing the present invention. The present invention finds utilization in packaging any material that can be bulk packaged. These items can encompass large bulk packaged pieces as well as very small bulk packaged pieces. Examples of smaller bulk goods include, but are not limited to, the following: agricultural products like seeds, rice, grains, vegetables, fruits, chemical products like fine chemicals, pharmaceuticals, raw chemicals, fertilizers, plastics like plastic resin pellets, plastic parts, rejected plastic parts, machined plastic parts, cereals and cereal products such as wheat, a variety of machined parts of all sorts, wood products like wood chips, landscaping material, peat moss, dirt, sand, gravel, rocks and cement. The present invention also finds utilization in bulk packaging of larger bulk goods including, but not limited to: prepared foods, partially processed foods like frozen fish, frozen chicken, other frozen meats and meat products, manufactured items like textiles, clothing, footwear, toys like plastic toys, plastic half parts, metallic parts, soft toys, stuffed animals, and other toys and toy products. All of these types of materials and similar bulk packaged materials are intended to be encompassed in the present specification and claims by this phrase.

While the present invention may be adapted to work with any number of packaging systems **26**, the exemplary embodiment of the present invention will be explained in reference to the exemplary packaging system **26** discussed below.

In the exemplary embodiment, the packaging system **26** includes a frame having an upper support **28** spaced from a frame base **30**. At least one support column **32** extends between the frame base **30** and upper support **28**. The upper support **28**, the frame base **30**, or both may be vertically movable along the support column **32**.

The packaging system **26** may include an upper turntable **34** that is mounted within the upper support **28** of the packaging system **26** and a lower turntable **36** that is mounted within the frame base **30** of the packaging system **26**. The lower turntable **36** and upper turntable **34** may be stationary or rotatable. When the upper turntable **34** and lower turntable **36** are rotatable, it is preferred that the rotation of the lower turntable **36** and upper turntable **34** are synchronized such that they rotate in unison. The synchronized rotation of the upper and lower turntables **34**, **36** allow for the even distribution of bulk goods in the transportable container **20**.

The packaging system **26** comprises a conventional stretch wrapping device **38** such as, for example, a Lantech Q series semi-automatic wrapper. The stretch wrapping device **38** further includes a wrap head having a roll of outer wrap secured on a wrap head base. In the preferred embodiment, the outer wrap is a stretch wrap **40** having a high cling factor and a width between 10 and 30 inches, but the stretch wrap **40** may be any of a variety of stretch wrap **40** films known in the art. The stretch wrap **40** may have a high coefficient of friction, which may lead to delaminating problems. Delaminating may be reduced by applying a glue between layers of stretch wrap **40**, welding the stretch wrap **40** layers or any other method of reducing delaminating known in the art. Welding the stretch wrap **40** may include, but is not limited to, heat or sonic welding.

When the upper turntable **34** and lower turntable **36** are rotatable, the wrap head is vertically moveable along a guide rod **42** that runs parallel to the support column **32**, and is moved up and down the guide rod **42** by a motor. As the transportable container **20** rotates between the upper turntable **34** and lower turntable **36**, stretch wrap **40** is pulled from the wrap head to create the transportable container **20**. When the upper turntable **34** and lower turntable **36** are stationary the wrap head is rotatable about the stationary transportable container **20** in addition to being vertically moveable along the guide rod **42** to apply the stretch wrap **40** and create the transportable container **20**.

The stretch wrap **40** generates hoop forces which apply a gentle squeeze to the bulk goods, helping to stabilize the bulk goods. The hoop forces stabilize the bulk goods by promoting controllable contact between the elements of the bulk goods being loaded into the transportable container **20** of the transportable container **20**, thereby promoting bridging between the components of the bulk goods. For example, when the bulk goods being loaded are a bulk cereal in puff or flake form, hoop forces promote bridging between cereal pieces, thereby reducing the relative motion between the pieces and immobilizing the cereal within the transportable container **20**. By adjusting the extent to which the outer wrap is applied to the transportable container **20**, hoop forces can be tailored to the type of bulk goods being inserted in the transportable container **20**. Hoop forces allow for a very compact and rigid transportable container **20**, which does not allow the bulk goods to shift or get crushed within the transportable container **20**.

The transportable container **20** includes a bottom support **72** that is placed on the frame base **30**. The bottom support **72** includes, but is not limited to a transporter base **22**, slip sheet **52**, pallet **54** or any other bottom support **72** known in the art. The slip sheet **52** is typically a folded sheet of cardboard, but may be any other material known in the art, including but not limited to plastic. The pallet **54** may be wood, plastic or any other material known in the art. Typically, the pallet **54** and the slip sheet **52** are used together.

In the preferred embodiment, a transporter base **22** is used and begins the initial forming of the transportable container **20**. The transporter base **22** is made of molded plastic, but may be manufactured by any process known in the art and made of any other material known in the art. In an exemplary embodiment, as shown in FIGS. **3** and **4**, the transporter base **22** is round, but the transporter base **22** may be square or any other shape known in the art. A round transporter base **22** is utilized to produce a round transportable container **20** while a square transporter base **22** is utilized to produce a square transportable container **20**. The square transporter base **22**, which results in a square transportable container **20**, is the preferred shape. The square transportable container **20** allows for the greatest amount of space to be utilized when a plurality of transportable containers **20** are placed next to one another in a shipping truck. The round transporter base **22**, which results in a round transportable container **20**, will lead to a void or wasted space being present when the round transportable containers **20** are placed next to one another in a shipping truck.

The transporter base **22** initially forms the bulk goods or particulates disposed in the transportable container **20** and further allows for the transportation of the transportable container **20**. The transporter base **22** includes a bottom **44** and a wall **46** extending peripherally from the bottom **44** to a wall end **48**. A plurality of ears extend radially outward from the wall end **48**. In the exemplary embodiment, the bottom **44** of the round transporter base **22** has a diameter of 48 inches and the wall **46** has a height of 8 inches. These

dimensions are the preferred dimensions, but the base diameter and wall **46** height may be adjusted. The wall **46** assists in the initial shaping of the transportable container **20**.

The transporter base **22** includes at least one pair of recesses **50** that extend upwardly from the bottom **44** of the transporter base **22** so that the tines of a transporting device can pickup and move the transportable container **20** of bulks goods. The transporter base **22** may further include a plurality of inwardly extending notches so the bulk goods will not conform directly to the inner surface of the transporter base **22**, which may be problematic in removing the bulk goods from the transporter base **22**.

The subject invention includes a slip frame former **24** to shape and form the transportable container **20**. The slip frame former **24** may be round, square or any other shape known in the art. The shape of the slip frame former **24** is chosen based on the desired shape of the transportable container **20**. The shape of the transportable container **20** is determined by the shape of the slip frame former **24**. For example, a round slip frame former **24** will produce a round transportable container **20** while a square slip frame former **24** will produce a square transportable container **20**.

In the exemplary embodiment, the slip frame former **24** includes at least one former wall **56** having an outer surface that defines a frame opening **78**. The former walls **56** are from about 6 to 15 inches in height and may be made from metal, plastic, or any other material known in the art. The former walls **56** are configured such that the frame opening **78** is the desired shape in which the transportable container **20** will be formed into. For example, when a square shaped transportable base is desired, the slip frame former **24** includes former walls **56** that are secured to one another to define the square shaped frame opening **78**. When a circular shaped transportable base is desired, the slip frame former **24** includes a continuous former wall **56** that is shaped to define a circular shaped frame opening **78**. In the exemplary embodiment, the former walls **56** have a continuous outer surface that extends from the bottom **44** of the slip frame former **24** to the top of the slip frame former **24**. When the slip frame former **24** is used in addition to the transporter base **22**, the slip frame former **24** will typically be the same shape as the transporter base **22** so as to hold the desired shape of the transporter base **22**. The slip frame former **24** may be a solid shape having former walls **56** or consist of a former base **58** having former arms **60** extending downwardly from the former base **58**. In some embodiments, the slip frame former includes four former walls defining the frame opening. In other embodiments, the four former walls define a monolithic structure.

The method of producing a transportable container **20** for flowable bulk goods begins by vertically spacing a slip frame former **24** from a bottom support **72**. A first portion of outer wrap is disposed around the bottom support **72** and a portion of the at least one former wall **56** to initially form the transportable container **20**. The transportable container **20** is initially formed prior to the addition of the plurality of bulk goods into the transportable container **20**. The plurality of bulk goods are then fed into the transportable container **20** through a frame opening **78** defined by the slip frame former **24** to establish a fill level **62**. At least one of the slip frame former **24** and the bottom support **72** moves vertically relative to other of the slip frame former **24** and the bottom support **72** in response to the fill level **62** of the bulk goods as determined by the fill sensor **76**. During filling, the slip frame former **24** is maintained at a position to surround the fill level **62** of the bulk goods in the transportable container **20**. As the fill level **62** increases in the transportable container **20**, previously disposed portions of outer wrap are disengaged from the slip frame former **24** to squeeze the filled portions of the transportable container **20** and lock together the bulk goods disposed in the transportable container **20**. Additional portions of outer wrap are disposed around a portion of the at least one wall **46** of the slip frame former **24** to maintain the transportable container **20** for receiving bulk goods as the previously disposed portions of stretch wrap **40** are disengaged from the at least one wall **46** of the slip frame former **24**.

In the exemplary embodiment, the outer wrap is a stretch wrap **40** that is disposed from a wrap head. The stretch wrap **40** is disposed spirally about the bottom support **72** and a portion of the at least one former wall **56** of the slip frame former **24** to initially form the transportable container **20**. Additional portions of stretch wrap **40** are spirally disposed about a portion of the at least one wall **46** of the slip frame former **24** to maintain the transportable container **20** for receiving bulk goods as previously disposed portions of outer wrap disengage the at least one wall **46** of the slip frame former **24**.

In an exemplary embodiment, the slip frame former **24** is moved vertically upwardly relative to the stationary bottom support **72** in response to the fill level **62** of the bulk goods in the transportable container **20**. The slip frame former **24** is maintained in a position to surround the fill level **62** of the bulk goods in the transportable container **20**. The slip frame former **24** is secured to the upper support **28**. With the slip frame former **24** in a lowered position, the stretch wrap **40** from the stretch wrapping device **38** is wrapped around the bottom support **72** and the slip frame former **24** to initially form the transportable container **20**. The slip frame former **24** moves upwardly with upper support **28** as a fill level **62** of bulk goods moves upwardly during filling of the transportable container **20**. The slip frame former **24** moves relative to the bottom support **72** to disengage the previously disposed portions of the stretch wrap **40** from the slip frame former **24** as the level of bulk goods rises in the transportable container **20**. The system can be adjusted to provide overlapping layers of outer wrap spaced apart from 0.5 to 15 inches. The stretch wrap **40** that is used to secure the transportable container **20** overlaps the slip frame former **24** so as to maintain the shape of the slip frame former **24**. The slip frame former **24** may include a Teflon coating or dimpled surface, particularly on the corners of the former walls **56** or the downwardly extending former arms **60**. The Teflon coating allows for the slip frame former **24** to be easily pulled away from the stretch wrap **40** as the slip frame former **24** moves in response the level of bulk goods.

In an alternative embodiment, the bottom support **72** is moved vertically downwardly relative to the stationary slip frame former **24** in response to the fill level **62** of the bulk goods in the transportable container **20**. The slip frame former **24** is maintained in a position to surround the fill level **62** of the bulk goods in the transportable container **20**. The lower turntable **36** and frame base **30** may vertically movable. With the slip frame former **24** in a lowered position, the stretch wrap **40** from the stretch wrapping device **38** is wrapped around the bottom support **72** and the slip frame former **24** to initially form the transportable container **20**. As the transportable container **20** disposed on the frame base **30** is filled, the frame base **30** is moved in a downward direction to accommodate additional bulk goods in the transportable container **20**. Movement of the lower turntable **36** can be accomplished by any of a variety of mechanisms including scissors platform legs, hydraulic pistons, pneumatic pistons, or a geared mechanism. The slip

frame former **24** moves relative to the bottom support **72** to disengage the previously disposed portions of the stretch wrap **40** from the slip frame former **24** as the level of bulk goods rises in the transportable container **20**. Again, the slip frame former **24** may include a Teflon coating to allow the stretch wrap **40** to be easily pulled away from the slip frame former **24** as the frame base **30** and stretch wrapping device **38** move downwardly from the slip frame former **24**.

The method forms a transportable container **20** for flowable bulk goods having a bottom support **72** and stretch wrap **40** spirally wrapped around the bottom support **72** The stretch wrap **40** extends vertically from the bottom support **72** to form the transportable container **20**. The transportable container **20** includes a plurality of flowable bulk goods that are disposed within the stretch wrap **40**. The stretch wrap **40** contacts at least a portion of the plurality of bulk goods to squeeze and lock together the plurality of bulk goods disposed in the transportable container **20**. No bag **68** is needed between the bulk goods and outer wrap.

In an alternative embodiment as seen in FIG. **3**, the former walls **56** of the slip frame former **24** may move radially inward and outward as the slip frame former **24** moves upwardly with upper support **28**. The radial position of the at least one former wall **56** is adjusted radially to modify the shape of the transportable container **20**. The radial movement of the former walls **56** of the slip frame former **24** may be controlled by hydraulic pistons, pneumatic pistons, a geared mechanism or any other method known in the art. In the exemplary embodiment, slip frame former **24** is segmented or made of fingers or rods. Each segment is movable independently or on a linkage such that when a command is received to move the slip frame former **24** radially inward or outward, the segments move in two directions, thus enabling the sides to move closer together or farther apart. This motion is controlled based on the particular shape desired. The radial movement of the slip frame former **24** results in the transportable container **20** having a shape that varies radially in vertical relationship to the bottom support **72**. For example, the shape of the transportable container **20** could be hour glass shaped as shown in FIG. **6**, tapered as shown in FIG. **7**, pumpkin shaped as shown in FIG. **8** or any other desired shape known in the art. In addition, the radial movement of the slip frame former **24**, as the fill level **62** of bulk goods rises, provides the benefit of increasing the effective hoop force on the bulk goods that are more difficult to lock up, resulting in a transportable container **20** having a corrugated shape in vertical relationship to the bottom support **72**.

In an alternative embodiment as shown in FIG. **9**, the outer wrap is a stretch tube or stretch bag **68**. The stretch bag **68** may be used in place of the stretch wrapping device **38** to form the transportable container **20**. A predetermined length of the stretch bag **68** is released with respect to the transportable container **20**. During the filling process, the predetermined length of the stretch bag **68** can be selected based on the filling rate. For example, a greater length of the stretch bag **68** can be released in response to a high fill rate. Alternatively, the length can be selected based on the density of the material. For example, a greater length of the stretch bag **68** can be released in response to a higher density fill material. The stretch bag **68** can be incrementally released from the bunched orientation or continuously released.

The slip frame former **24** is initially disposed adjacent the bottom support **72**. A first portion of the radially flexible stretch bag **68** is disposed around the bottom support **72** and a portion of the slip frame former **24** to initially form the transportable container **20**.

The transportable container **20** is then filled with a plurality of bulk goods through an opening in the stretch bag **68**. The opening of the radially flexible stretch bag **68** is reduced to a smaller fill diameter substantially at the slip frame former **24** as the fill level **62** rises during filling of the transportable container **20**. As discussed above, the slip frame former **24** may include a Teflon coating or dimpled surface, particularly on the corners of the former walls **56** or the downwardly extending arms. The Teflon coating allows for the slip frame former **24** to be easily pulled away from the stretch bag **68** as the slip frame former **24** moves upwardly in response the level of bulk goods. The large diameter is reduced by radially stretching the stretch bag **68** prior to filling and, after filling substantially to the fill level **62**, releasing a stretched portion of the transportable container **20** substantially adjacent the slip frame former **24**. In other words, the transportable container **20** can be expanded to define the opening for receiving bulk goods. The packaging system **26** can include a stretching device **90** to radially stretch the stretch bag **68** prior to filling. The stretch bag **68** may be formed from any food grade material, such as for example, low density polyethylene, high density polyethylene, a food grade polymer, or nylon.

The slip frame former **24** moves relative to the bottom support **72** to disengage the previously disposed portions of the stretch bag **68** from the slip frame former **24** as the level of bulk goods rises in the transportable container **20**. Additional portions of the stretch bag **68** are disposed around a portion of the slip frame former **24** to maintain the transportable container **20** for receiving bulk goods as previously disposed portions of the stretch bag **68** disengage the slip frame former **24**.

The reduction of the stretch bag **68** at the slip frame former **24** by releasing a stretched portion of the stretch bag **68** at the fill level **62** generates hoop forces which apply a gentle squeeze to the bulk goods, helping to support and firm it. The hoop forces stabilize the bulk goods by promoting controllable contact between the elements of the bulk goods being loaded into the stretch bag **68**, thereby promoting bridging between the components of the bulk goods. For example, when the bulk goods being loaded are a bulk cereal in puff or flake form, hoop forces promote bridging between cereal pieces, thereby reducing the relative motion between the pieces and immobilizing the cereal within the stretch bag **68**. By adjusting the extent of shrinkage, hoop forces can be tailored to the type of bulk goods being inserted in the transportable container **20**. Hoop forces allow for a very compact and rigid transportable container **20**, which does not allow the bulk goods to shift or get crushed within the transportable container **20**.

In an alternative embodiment as shown in FIG. **10**, the outer wrap is a heat shrink film **70**. The heat shrink film **70** may be used in place of the stretch wrapping device **38** or stretch bag **68** to initially form the transportable container **20**. The slip frame former **24** is disposed adjacent the bottom support **72**. A first portion of the heat shrink film **70** is disposed around the bottom support **72** and a portion of the slip frame former **24** to initially form a transportable container **20**.

The transportable container **20** is filled with a plurality of bulk goods through an opening in the heat shrink film **70**. The opening of the radially flexible heat shrink film **70** is reduced to a smaller fill diameter substantially at the slip frame former **24** as the fill level **62** rises during filling of the flexible heat shrink film **70**. As discussed above, the slip frame former **24** may include a Teflon coating or dimpled surface, particularly on the corners of the former walls **56** or

the downwardly extending arms. The Teflon coating allows for the slip frame former **24** to be easily pulled away from the heat shrink film **70** as the slip frame former **24** moves upwardly in response the level of bulk goods. The large diameter is reduced by shrinking the heat shrink film **70** prior to filling and, after filling substantially to the fill level **62**, shrinking a portion of the heat shrink film **70** substantially adjacent the slip frame former **24**. In other words, the transportable container **20** can be expanded to define the opening for receiving bulk goods. The packaging system **26** provided by the invention includes a shrinking device to shrink the large diameter. The shrinking device can include a heater **92** to direct heat at transportable container **20** adjacent the slip frame former **24** to shrink the large diameter to the fill diameter. Preferably, the shrinking device is kept within plus or minus twelve inches of the fill level **62**.

The slip frame former **24** moves relative to the bottom support **72** to disengage the previously disposed portions of the heat shrink film **70** from the slip frame former **24** as the level of bulk goods rises in the transportable container **20**. Additional portions of the heat shrink film **70** are disposed around a portion of the slip frame former **24** to maintain the transportable container **20** for receiving bulk goods as previously disposed portions of the heat shrink film **70** disengage the slip frame former **24**.

The reduction of the heat shrink film **70** at the slip frame former **24** by shrinking the heat shrink film **70** to form the transportable container **20** at the fill level **62** generates hoop forces which apply a gentle squeeze to the bulk goods, helping to support and firm it. The hoop forces stabilize the bulk goods by promoting controllable contact between the elements of the bulk goods being loaded into transportable container **20**, thereby promoting bridging between the components of the bulk goods. For example, when the bulk goods being loaded are a bulk cereal in puff or flake form, hoop forces promote bridging between cereal pieces, thereby reducing the relative motion between the pieces and immobilizing the cereal within the transportable container **20**. By adjusting the extent of shrinkage, hoop forces can be tailored to the type of bulk goods being inserted in the transportable container **20**. Hoop forces allow for a very compact and rigid container, which does not allow the bulk goods to shift or get crushed within the transportable container **20**.

The transportable container **20** can be closed or left open depending on bulk goods. For example, certain bulk goods such as wood chips, sand, gravel, and other bulk goods, may not require that transportable container **20** be closed. In such instances, the stretch wrap **40** stretch bag **68** or heat shrink film **70** would be applied around the bulk goods in an upward direction to secure bulk goods and create the transportable container **20**. Alternatively, the transportable container **20** may be closed in any of a variety of manners known in the art including, but not limited to: sonic or heat welding of the top of the transportable container **20**, closure of the top of the transportable container **20** with a plastic pull tie, closure of the top of the transportable container **20** with wire or rope, closure of the top of the transportable container **20** with a clamp, and other closure means known in the art.

The subject invention may further include a second stretch wrapping device **64** for closing the transportable container **20**. The second stretch wrapping device **64** includes a wrap head having a roll of secondary wrap **66** secured on a wrap head base. The secondary wrap **66** is preferably a heat sealable polyethylene or other flexible poly or plastic film, but the secondary wrap **66** may be any of a variety of secondary wrap **66** films known in the art. When the fill level **62** has reached it desired level, the slip frame former **24** is pulled away from the transportable container **20** and the secondary wrap **66** is applied to transportable container **20**. The secondary wrap **66** extends upwardly from the transportable container **20** and can be used to create a top flap. The top flap is folded over and stretch wrap **40** is applied over the folded top flap to seal the transportable container **20**. In addition, the secondary wrap **66** may be welded or heat sealed. A heater (not shown) can be used to direct heat at excess material of secondary wrap **66** at the top of the transportable container **20** to seal the transportable container **20**. Additionally, a heater can be used to direct heat at excess material of stretch wrap **40**, secondary wrap **66**, stretch bag **68** or heat shrink film **70** at the top of the transportable container **20** to seal the transportable container **20**.

Further, the transportable container **20** may be closed by placing a top support **80** upon the filled transportable container **20**. The top support **80** is vertically spaced from the bottom support **72** and wrapped within the stretch wrap **40** to form a cover or top for the transportable container **20**. The top support **80** may be a transporter base **22** as seen in FIG. **4**, a slip sheet **52** as seen in FIG. **5**, or a flat sheet of cardboard or plastic on the top of the transportable container **20**. After placement of the transporter base **22**, slip sheet **52** or flat sheet on the top of the transportable container **20**, the transportable container **20** is wrapped with additional stretch wrap **40** to secure the transporter base **22**, slip sheet **52** or flat sheet on the top of the transportable container **20**.

The system preferably includes a control panel to permit an operator to control various functions such as stop, start, rotation speed and wrap head movement speed. Such controls are known in the art. The system further includes controls to maintain proper fill level **62**, outer wrap force and sequencing. The relationship of these parameters is constantly monitored and automatically adjusted by means known in the art.

The foregoing invention has been described in accordance with the relevant legal standards, thus the description is exemplary rather than limiting in nature. Variations and modifications to the disclosed embodiment may become apparent to those skilled in the art and do come within the scope of the invention. Accordingly, the scope of legal protection afforded this invention can only be determined by studying the following claims.

What is claimed is:

1. A system for producing a transportable container for flowable bulk goods, the system comprising:

a slip frame former having at least one former wall defining a frame opening;

a bottom support vertically spaced from the slip frame former, the bottom support having a bottom and a wall extending peripherally from the bottom to a wall end;

wherein the at least one former wall and the wall of the bottom support are in engagement with a first portion of outer wrap to form a portion of the transportable container;

wherein at least one of the slip frame former and the bottom support is vertically moveable relative to the other of the slip frame former and the bottom support to maintain a position of the slip frame former relative to a fill level of bulk goods in the transportable container;

wherein the slip frame former is configured to disengage previously received portions of outer wrap therefrom to squeeze filled portions of the transportable container and lock together the flowable bulk goods disposed in

the transportable container as the at least one of the slip frame former and the bottom support moves relative to the other of the slip frame former and the bottom support; and

wherein a portion of the at least one former wall is configured to receive additional portions of outer wrap to maintain the transportable container and continue to form the transportable container as previously disposed portions of outer wrap disengage the at least one former wall.

2. The system as set forth in claim **1**, further comprising a first wrap head operable to spirally apply the first portion of outer wrap about the wall of the bottom support and the portion of the at least one former wall to initially form the transportable container, and wherein the first wrap head is operable to spirally apply the additional portions of outer wrap about the portion of the at least one former wall to maintain the transportable container as previously disposed portions of outer wrap disengage the at least one former wall.

3. The system as set forth in claim **2**, further comprising a second wrap head operable to apply a secondary wrap defining a top flap of the transportable container.

4. The system as set forth in claim **1**, wherein the outer wrap includes a stretch bag, the system further comprising a stretching device to radially stretch the stretch bag prior to filling the transportable container.

5. The system as set forth in claim **1**, wherein the outer wrap includes a heat shrink film, the system further comprising a shrinking device including a heater to direct heat at the heat shrink film adjacent the slip frame former to shrink the heat shrink film from a large diameter to a smaller fill diameter.

6. The system as set forth in claim **1**, wherein the at least one former wall includes four former walls defining the frame opening.

7. The system as set forth in claim **6**, wherein the four former walls define a monolithic construct.

8. The system as set forth in claim **1**, wherein the frame opening is configured to receive the flowable bulk goods therethrough.

9. The system as set forth in claim **1**, further comprising an upper support, a frame base, and a support column extending between the upper support and the frame base, wherein the slip frame former is disposed between the upper support and the frame base.

10. The system as set forth in claim **9**, wherein at least one of the upper support and the frame base is vertically moveable along the support column.

11. The system as set forth in claim **10**, wherein the slip frame former is vertically moveable with the upper support.

12. The system as set forth in claim **10**, wherein the slip frame former is secured to the upper support.

13. The system as set forth in claim **1**, wherein a position of the at least one former wall is radially adjustable as the at least one of the slip frame former and the bottom support moves relative to the other of the slip frame former and the bottom support to modify a shape of the transportable container.

14. The system as set forth in claim **1**, wherein the bottom support includes a transporter base or slip sheet.

15. The system as set forth in claim **1**, wherein the bottom and the wall of the bottom support define a volume for containing a portion of the flowable bulk goods.

16. A system for producing a transportable container for flowable bulk goods, the system comprising:

a slip frame former having at least one former wall defining a frame opening;

a bottom support vertically spaced from the slip frame former;

wherein the at least one former wall and the bottom support are configured to receive a first portion of outer wrap to form a portion of the transportable container;

wherein at least one of the slip frame former and the bottom support is vertically moveable relative to the other of the slip frame former and the bottom support to maintain a position of the slip frame former relative to a fill level of bulk goods in the transportable container;

wherein the slip frame former is configured to disengage previously received portions of outer wrap therefrom to squeeze filled portions of the transportable container and lock together the flowable bulk goods disposed in the transportable container as the at least one of the slip frame former and the bottom support moves relative to the other of the slip frame former and the bottom support;

wherein a portion of the at least one former wall is configured to receive additional portions of outer wrap to maintain the transportable container and continue to form the transportable container as previously disposed portions of outer wrap disengage the at least one former wall; and

wherein a position of the at least one former wall is radially adjustable as the at least one of the slip frame former and the bottom support moves relative to the other of the slip frame former and the bottom support to modify a shape of the transportable container.

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